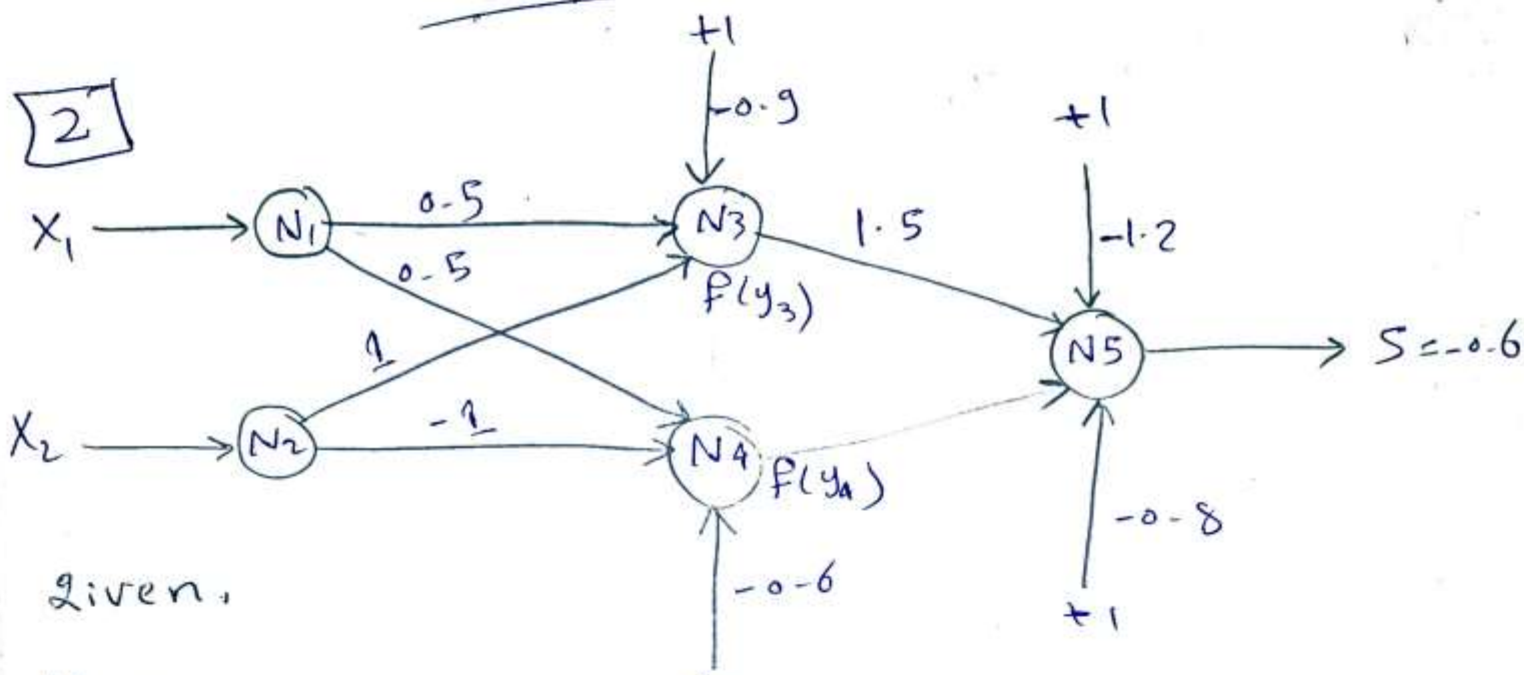
Neural · sec 5

$\boxed{2}$



given,

$N_3, N_4 \rightarrow$ binary sigmoidal

N_5: bipoler sigmoidal , $f(y_4) = 2f(y_3)$

$\boxed{sol}$

$$y_5 = Ln\left[\frac{1+g(y_5)}{1-g(y_5)}\right] = -1.386$$

$$y_5 = 1.5 f(y_3) - 1.5 f(y_4) - 1.2 = -1.386$$

$$1.5 f(y_3) - 3 f(y_4) - 1.2 = -1.386$$

$f(y_3) = 0.124$, $f(y_4) = 0.248$

$$y_3 = Ln\left[\frac{f(y_3)}{1-f(y_3)}\right] = -1.955$$

$$y_4 = Ln\left[\frac{f(y_4)}{1-f(y_4)}\right] = -1.109$$

$$y_3 = 0.5\,x_1 + x_2 - 0.9 = -1.955 \rightarrow (1)$$

$$y_4 = 0.5\,x_1 - x_2 - 0.6 = -1.109 \rightarrow (2)$$

$$\boxed{\begin{aligned} x_1 &= -1.364 \\ x_2 &= -0.373 \end{aligned}} \leftarrow \text{solve (1) \& (2)}$$

[II] $h(\alpha x) = \tanh(\alpha x)$

$\alpha \rightarrow$ Positive Parameter

a) $h(\alpha x) = \dfrac{2}{1+e^{-2\alpha x}} - 1$

b) $\dfrac{d[h(\alpha x)]}{dx} = \alpha\left[1 - h^2(\alpha x)\right]$

c) $\dfrac{d[h(\alpha x)]}{dx} = \alpha \qquad x = 0$

d) $\dfrac{d^2[h(\alpha x)]}{dx} = -2\alpha^2 h(\alpha x)\left[1 - h^2(\alpha x)\right]$

Sol

a)
$$h(\alpha x) = \frac{\sin(\alpha x)}{\cos(\alpha x)} = \frac{\left(e^{\alpha x} - e^{-\alpha x}\right)/2}{\left(e^{\alpha x} + e^{-\alpha x}\right)/2} * \frac{e^{-\alpha x}}{e^{-\alpha x}}$$

$$= \frac{2}{1+e^{-2\alpha x}} - 1$$

b)
$$\frac{d}{dx}\left[h(\alpha x)\right] = \frac{d}{dx}\left(\tanh(\alpha x)\right) = \alpha \operatorname{sech}^2(\alpha x)$$

$$= \alpha\left[1 - \underbrace{\tanh^2(\alpha x)}_{h^2(\alpha x)}\right]$$

$$= \alpha\left[1 - h^2(\alpha x)\right]$$

c)
$$\frac{d}{dx}\left[h(\alpha x)\right]_{max} \Rightarrow \frac{d}{dx}\left[\tanh(\alpha x)\right] = \cancel{\alpha \operatorname{sech}^2(\alpha x)} \; \cancel{\alpha\left[1-\tanh^2(\alpha x)\right]}$$

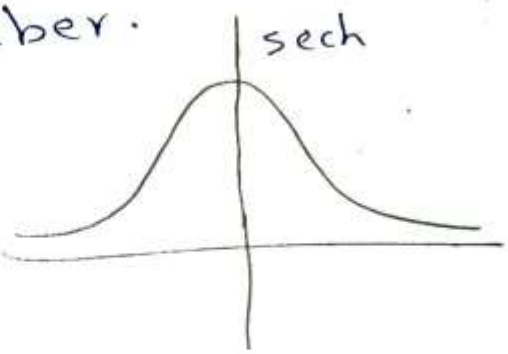
$$= \alpha\left(1 - \tanh^2(\alpha x)\right)$$

$$\frac{d^2}{dx^2}\left[\tanh(\alpha x)\right] = \alpha^2\left[-2\tanh(\alpha x)\operatorname{sech}^2(\alpha x)\right]$$

$$-2\alpha^2 \tanh(\alpha x)\, \operatorname{sech}^2(\alpha x) = 0$$

← مش هتنفع تكون $\operatorname{sech}^2(\alpha x)$ أو α بصفر

Cause, $\alpha \rightarrow$ Positive number.



$\operatorname{sech}(\alpha x) \longrightarrow$ عمرها ماتكون بصفر.

$\tanh(\alpha x) = 0 \longrightarrow x = 0$

Put $x = 0$ in the 1st derivative

$$\frac{d}{dx}\Big[h(\alpha x)\Big]_{max} = \alpha\big(1 - \underbrace{\tanh(\alpha x)}_{x=0}\big) = \alpha$$

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d) <u>from c</u>

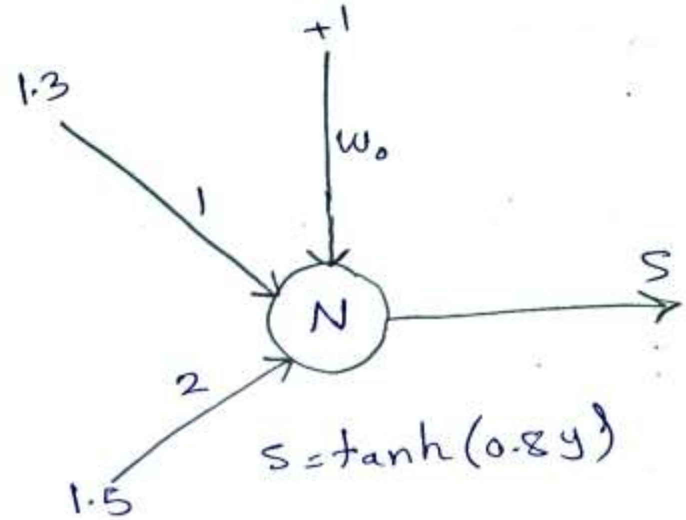
$$\frac{d^2}{dx^2}\Big[h(\alpha x)\Big] = -2\alpha^2 \tanh(\alpha x)\, \operatorname{sech}^2(\alpha x)$$

$$= -2\alpha^2\, h(\alpha x)\left[1 - h^2(\alpha x)\right]$$

$\boxed{2}$

a) $w_0 = -2.5$ find s

b) $s = 0.71$ find w_0



$y = 1.3 + 3 + w_0 = 4.3 + w_0$

a) $w_0 = -2.5$

$y = 4.3 - 2.5 = 1.8$

$s = \tanh(0.8 * 1.8) = 0.894$

b) $s = 0.71 = \tanh(0.8y)$

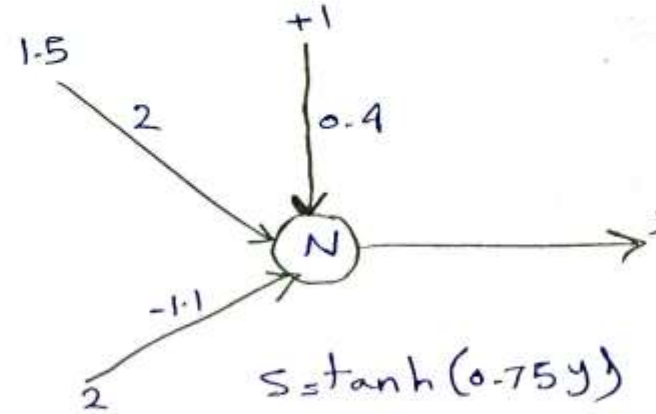
$y = 1.109$

$y = 4.3 + w_0 = 1.109$

$\boxed{w_0 = -3.191}$

3

a) $s = \tanh(0.75y)$



$y = 1.2$

$s = 0.716$

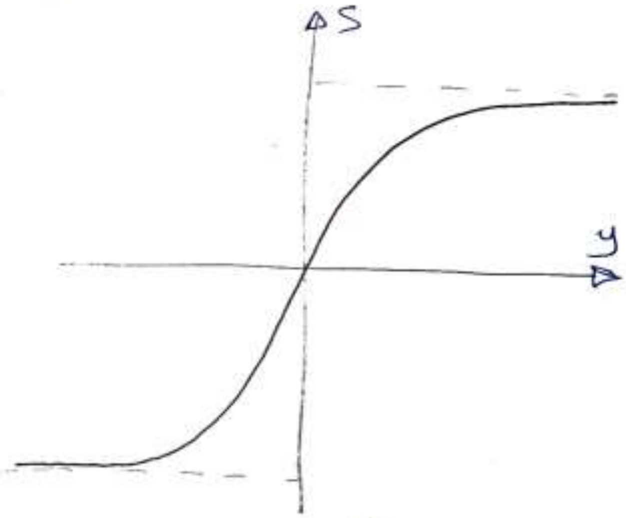
b) $\frac{ds}{dy} = \alpha\, \text{sech}^2(\alpha y) = 0.75\ \text{sech}^2(0.75 * 1.2)$

$= 0.366$

c)

S:

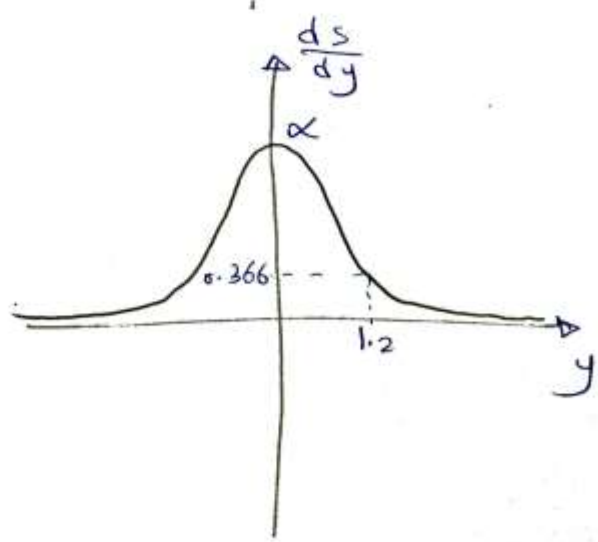
y	-2.5 - - - - -
S	-0.954



d)

$\frac{ds}{dy}$

y	- - - - - -
$\frac{ds}{dy}$	- - - - - -

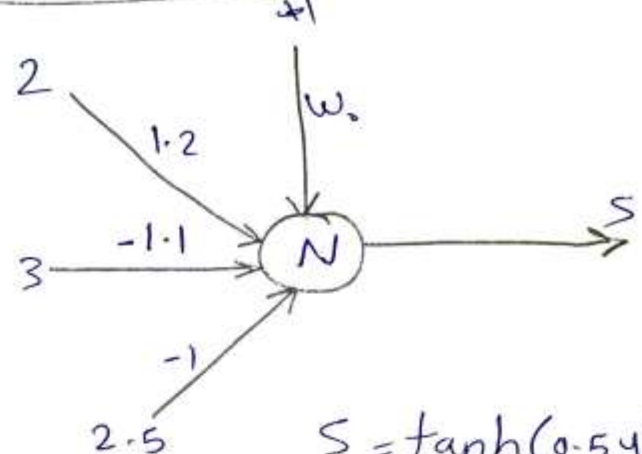


e) max $\longrightarrow$ y

$y = 0$, max. $= 0.75$

Find $w_0 \rightarrow \frac{ds}{dy} = 0.226$

$\hookrightarrow y, s$



$S = \tanh(\underbrace{0.5}_{\alpha = 0.5} y)$

$y = -3.4 + w_0$

$$\frac{ds}{dy} = \alpha \operatorname{sech}^2(\alpha y) = 0.5 \operatorname{sech}^2(0.5y) = 0.226$$

$$= 0.5\left(1 - \tanh^2(0.5y)\right)$$

$y = \pm 1.9$

a) $y = 1.9 \Rightarrow w_0 = 5.3$

$S = \tanh(0.5y) = +0.74$

b) $y = -1.9 \longrightarrow w_0 = 1.5$

$S = -0.74$